

hydroxyalkoxycarbonylalkyl, hydroxy(polyalkoxy)carbonylalkyl, mercaptoalkyl, mercaptoalkylenyl, mercaptoalkoxycarbonylalkyl, mercaptoalkoxycarbonylalkylenyl, alkoxycarbonyl(amido)alkyl, alkylcarbonyloxy(polyalkoxy)carbonylalkyl, tetrahydropyranyloxy(polyalkoxy)carbonylalkyl, tetrahydropyranyloxyalkyl, hydroxyaryl, mercaptoaryl or carboxyaryl radical having from 1 to 22 carbon atoms;  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ , and  $R^7$  are independently hydrogen, a hydroxyl, mercapto, acyl, alkyl, alkylenyl, aryl, haloaryl, alkaryl, aralkyl, hydroxyalkyl, mercaptoalkyl, hydroxyaryl, alkoxyaryl, alkoxyhydroxyaryl, mercaptoaryl groups having from 1 to 22 carbon atoms; X is aryl, haloaryl, alkaryl, hydroxyaryl, dihydroxyaryl, alkoxyaryl, arylcycloalkyl, or a heteroatom, with the option that when a is 1 and m is 1,  $R^6$  and  $R^7$  form a heterocyclic moiety in conjunction with X as nitrogen, and with the further option that when a = 1 and m = 0, one of  $R^1$ ,  $R^3$ , and  $R^5$  joins with  $R^7$  and X to form a heterocyclic moiety with X as a heteroatom selected from the group consisting of oxygen and sulfur; with the proviso that z is 1 or 2 when X is aralkaryl,  $R^6$  and  $R^7$  are hydroxyl, a is 1 and m is 1, and with the further proviso that when  $R^6 \neq$  hydroxyl or mercapto, z is 1;

from about 0.005 to about 2.0 phr of a synergistic mixture of zinc chloride and a zinc carboxylate; and

from 0 to about 10 phr of at least one co-stabilizer selected from the group consisting of an epoxy compound and an organic phosphite, based on the weight of the polymer.

For the purposes of this invention, the terms "blocked mercaptan" and "latent mercaptan" are used interchangeably to mean a thioether which degrades during processing of the composition at an elevated temperature to liberate a free

mercaptan.

Other products of the degradation of the latent mercaptan are believed to include carbocations of the blocking moiety which are stabilized by a molecular structure in which the electron deficiency is shared by several groups. Resonance stabilization and neighboring group stabilization are two of the possible mechanisms by which the carbocations may be stabilized. The carbocations act as intermediates in the formation of stable compounds early in the hot processing of halogen-containing polymers. Although such mechanisms and the resultant carbocations are believed to be an impetus for the liberation of the active free mercaptan, this invention is in no way limited by the foregoing attempt to explain the working of the invention. Those skilled in the art will see the resonance stabilization and neighboring group stabilization that are possible in the following structures of the blocked mercaptan; other mechanisms may be at work in other blocked mercaptans represented by these structures that also liberate an active free mercaptan upon thermal and/or chemical degradation during processing of polymeric compositions containing such blocked mercaptans.

#### DETAILED DESCRIPTION OF THE INVENTION

The term halogen-containing organic polymers as used herein means halogen-containing polymers or resins in which the halogen is attached directly to the carbon atoms. The halogen-containing polymers which can be stabilized according to this invention include chlorinated polyethylene having 14 to 75%, e.g. 27%, chlorine by weight, chlorinated natural and synthetic rubber, rubber hydrochloride, chlorinated polystyrene, chlorinated polyvinyl chloride, polyvinyl bromide, polyvinyl fluoride, and vinyl chloride polymers. The

vinyl chloride polymers are made from monomers consisting of vinyl chloride alone or a mixture of monomers comprising, preferably, at least about 70% by weight of vinyl chloride, based on the total monomer weight. Examples of the copolymers include those made from vinyl chloride and from about 1 to about 30% of a copolymerizable ethylenically unsaturated material such as vinyl acetate, vinyl butyrate, vinyl benzoate, vinylidene chloride, diethyl fumarate, diethyl maleate, other alkyl fumarates and maleates, vinyl propionate, methyl acrylate, 2-ethylhexyl acrylate, butyl acrylate and other alkyl acrylates, methyl methacrylate, ethyl methacrylate, butyl methacrylate and other alkyl methacrylates, methyl alpha-chloroacrylate, styrene, trichloroethylene, vinyl ketones such as vinyl methyl ketone and vinyl phenyl ketone, 1-fluoro-2-chloroethylene, acrylonitrile, chloroacrylonitrile, allylidene diacetate, chloroallylidene diacetate, and vinyl ethers such as vinyl ethyl ether, vinyl chloroethyl ether, vinyl phenyl ether, and the vinyl ether prepared by the reaction of one mole of acrolein with one mole of ethylene glycol divinyl ether. Typical copolymers include vinyl chloride-vinyl acetate (96:4 sold commercially as VYNW), vinyl chloride-vinyl acetate (87:13), vinyl chloride-vinyl acetate-maleic anhydride (86:13:1), vinyl chloride-vinylidene chloride (95:5); vinyl chloride-diethyl fumarate (95:5), and vinyl chloride 2-ethylhexyl acrylate (80:20).

As used herein, the term PVC composition means a composition comprising a halogen-containing vinyl polymer in which the halogen is attached directly to a carbon atom. A rigid PVC composition is one which does not contain a plasticizer. A semi-rigid PVC composition is one which